**Date:** September 23, 1983

**Subject:** Primary Metals R&D Monthly Report - September 1983

**From/Location:** E. L. Cambridge

**To/Location:** J. G. Kaufman

## PRIMARY ALUMINUM

### MLI Technology Implementation

Columbia Falls has begun making MLI carbon paste for a twenty-pot test.

Preliminary work has begun to develop MLI Anode Materials testing equipment at Tucson in 1984. All available MLI literature is being reviewed and a list of key questions we need to ask during a planned visit to Japan in November is being prepared. This review will be completed by October 12.

The Columbia Falls laboratory is preparing paste samples from each of three coke vendors; ARCO, Collier and Martin Marietta. The granulometries in the samples will represent the Columbia Falls standard and the two MLI proposed curves. We will test baked composites of these samples as requested for carbon consumption, $CO_2$ reactivity and airburn by the end of November.

### Anode Consumption Cell

The anode consumption cell is now in working order. Procedures have been developed to overcome the problems of construction material failures during operation. Three runs have been completed this month. The goals of our current work are to develop procedures for obtaining better reproducibility and controlling bath composition.

## NEW PRODUCTS/PROCESS/OPPORTUNITIES

### AD-123

(1) Semi-pilot scale production of 300 lb batches of ACH from Bayer ATH was initiated 9/16/83 and will continue until ~2000 lbs are accumulated. Decomposition will require modification of the existing scrubber system to accommodate the Bartlett-Snow indirect heated rotary kiln recently received from Boulder City. Ultimately, calcination and ball mill grinding tests will be carried out to determine physical and ceramic properties of the finished product. Completion of this phase of the project should be in early November.

(2) Recent laboratory tests have shown that:

- Unreacted $SiO_2$ in HCl liquor can be removed by centrifugal methods. Tests aimed at evaluating the effectiveness of continuous flow centrifuges for removal of trace quantities of unreacted solids in aqueous HCl have been scheduled with the Dorr-Oliver Corporation. If successful, production of virtually silica free SPA could be expected. Process parameters which would allow utilizing this approach for $SiO_2$ control are now being evaluated.

- Kinetics of the ATH and HCl $\longrightarrow$ ACH reaction are also being studied with respect to their effect on pilot reaction vessel design (e.g. external heat input requirements, effective acid concentration ranges, etc.).

- Further mass balance investigations are being carried out particularly with respect to effects on product by recycled, highly soluble, trace contaminants (e.g. $FeCl_3$, $CaCl_2$, $GaCl_3$). Initial tests indicate that with proper product washing high concentrations of soluble trace components can be tolerated.

AD-120 - Bleed Stream Pilot Plant Operations

Tom Bolles has been assigned operations leader for the bleed stream pilot plant operations. John Herod, Bill Palmer and Byron McMillan have been assigned shift lead technicians. Nine temporary technicians have been employed, three being assigned to each of the lead technicians. Katy Gray has been assigned day shift technician.

A general pilot plant organizational meeting was held on September 14 with all employees assigned to the project attending. Subjects covered were: (1) Project Goals, (2) Principles of Operation, (3) Organizational Structure, (4) Job Descriptions, (5) Operation Procedures, (6) Safety, and (7) Emergency Procedures.

The operations plan is to conduct four ten-day campaigns beginning September 21 and ending November 11. The goals of the first campaign, which is now in progress, are: (1) to bring the facility to the point of being fully operational, (2) achieve process equilibrium at least once, and (3) collect preliminary data. The goal of the last three campaigns is to run the bleed stream continuously with varying operating parameters while collecting all planned data.

AD 120 - Ore to PCACH

(1) A series of eight two level factoral design experiments evaluating crystallizer operating characteristics have been completed. Analysis of the data is in progress. 36 five gallon drums of ACH were produced and will be used in calcination work. No further crystallizer operations are planned during the period in which the Bleed Stream Pilot Plant is in operation.

(2) The lab scale ACH Fluid Bed Calciner has been completely tied into the Isaac/Apple data acquisition process control computer and tested. All bugs have been worked out of the program so that the calciner runs itself. The calciner has been filled with alumina from ACH and fluidization of the alumina was observed. All mass flow controllers have been tested and work although it took repiping the steam system to get the steam mass flow controller to work.

The only problem remaining is feeding the calciner with ACH. Experimenting with the Vibrascrew screwfeeder has led to a system that seems to work. Warming the screw, the discharge tube, the feed trough and feed bin seems to provided enough drying to keep the ACH from sticking and so the ACH continued to feed the screw. To accomplish this a Hastelloy C-276 feed trough and teflon coated screw are being purchased and should be on site in three weeks.

(3) Alternative Bleed Stream Waste Neutralization Process - A $2^{7-4}$ factorial design experiment was completed in which a synthetic waste stream (discharge from bleed stream treatment) and clay leach residue are reacted. The goal is to recover chloride and immobilize metal residues. In several experiments the material did react to produce a low chloride, insoluble residue. After complete analysis of the results and on assessment of the economic implications more experiments will be planned, as warranted.

AD-120 - Chlorination

HPFB - Various minor modifications on both the one and two inch HPFB were continued this month with the result that both beds are now considered fully operational for long term runs.

AD-124

The design for the 2 kA electrolysis cell is now complete and materials are being ordered. We expect to have the cell ready for start-up by mid-November. Work also continued to define a specific electrolyte composition for use in the slurry concept.

## R&D FACILITIES

Carbon Laboratory Equipment

An AFC is being prepared for the purchase of additional carbon screening equipment which will give us the ability to provide needed carbon fractions for the AD-120 Coke Optimization and MLI Implementation projects. Carbon screening is a bottleneck in our current configuration. The proposed equipment will assure the timely availability of required screen fractions with about half the technician time we are currently using. The AFC will request about $13M.

## AD-123 Equipment

A portable building to house the Bickley gas fired laboratory kiln has been constructed just north of the Carbon and Reduction Research building. Kiln delivery is expected by late October. Laboratory calcination tests are scheduled as soon as this unit is operable.

## AD-123 Pilot Plant

Site planning for the proposed AD-123 pilot plant is now underway. Building bids will be asked for as soon as possible. A tentative building site for this facility in the northeast corner of the Tucson Research Center property has been selected.

## USBM Equipment

The first four loads of equipment from the Boulder City miniplant have been received. The Bartlett-Snow rotary kiln and a scrubber system will be set up for use in the AD-123 process for calcining ACH produced in the batch plant. FRP receiver tanks from the first load have been tied into the filtration system in the AD-123 process. One or two additional loads of equipment are anticipated over the next week. The equipment will be stored on the concrete pad east of the Carbon and Reduction Lab and in the Sample Storage building. As soon as it is all received the equipment will be tagged for inventory control and the storage area will be fenced.

## Environment, Safety and Health

The necessary paperwork to support our request for the AD-120 R&D work to be classified as a controlled waste manufacturing process for PCB's is now in place. F. J. Traversone has proceeded with the request to the EPA. Guidelines for collection and storage of possible PCB containing waste will be established over the next week.

The scrubber system for the AD-123 batch plant has been approved by the Pima County Health Department and approval of the AD-120 Bleed Stream HCL recovery system is expected shortly.

# R&D STAFF

## Reports

The following reports were issued:

83-TP-2 "AD-108 Progress Report No. 1 Laboratory Tests of Composite Anode Particle Concept," by R. O. Loutfy and J. C. Withers

83-TP-4 "Subvalent Disproportionation of Aluminum Monochloride in a Molten Salt Bath," by J. B. Snodgrass

Computer Training

Dave Moran and John Snodgrass will be attending a PROJECT/2 training session in San Francisco during the week of September 26. In-house PROJECT/2 expertise will give us the needed ability to easily develop detailed project plans and schedules.

Lynn Taylor from RMI will present a two-day SAS Training Program in Tucson during the week of November 14. SAS is a powerful programming language which will allow us to do sophisticated file manipulation and data analysis. Our immediate need for this expertise is on the AD-120 project.

Headcounts

Katherine Gray has submitted her resignation for personal reasons, effective September 29, 1983. As a result, month end head count will be

| | | | |
|---|---|---|---|
| Exempt | 14 | Minority | 3 |
| Non-Exempt | 10 | Minority | 4 |
| Totals | 24 | | 7 |

14 temporary employees are currently on site, primarily to support Bleed Stream Pilot and AD-123 batch plant operations.

Ted

E. L. CAMBRIDGE

ELC:dg

cc: J.C.Withers
D.M.Blake
D. S. Moran
R. W. Bartlett
R. J. F. Thorpe
T. Scott
T. E. Fine
W. W. Collins
S. Maitra